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ABSTRACT

A study combined a simple mnemonic counting system with the keyword method to determine whether the keyword vocabulary methods can be effectively combined with other mnemonic strategies to facilitate coding of numerically ordered information. This system was then taught to 48 eighth-grade students in the context of learning the names and numbers of 20 United States presidents. The mnemonic strategy represented a combination of three pictorial techniques: the method of loci, the pegword method, and the keyword method. Subjects were randomly assigned in equal numbers to one of two experimental conditions (mnemonic or control) and to one of two list orders (chronological or alphabetical). Before the study, students in all conditions were told that at test time half of the time they would be given a name and asked for a number, while the other half of the time they would be given a number and asked for a name. Results showed that students taught according to the combined mnemonic strategy out performed the control subjects, whether provided with a well-ordered set of presidents during input (presidents presented in their proper serial order) or a more complicated set (presidents presented in alphabetical order). (HOD)

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Working Paper No. 307

INVESTIGATION OF A COMBINED MNEMONIC STRATEGY FOR TEACHING THE ORDER OF U.S. PRESIDENTS

by

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Report from the Project on
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Abstract

Eighth-grade students were taught the names and numbers of a set of U.S. presidents according to a specially devised strategy. The strategy represented a combination of three pictorial mnemonic techniques: the method of loci, the pegword method, and the keyword method. Students taught according to the combined mnemonic strategy outperformed time-equivalent controls, whether provided with a well-ordered set of presidents during input (i.e., presidents presented in their proper serial order) or a more complicated set (i.e., presidents presented in alphabetical order). Additional mnemonic possibilities for research and practice are discussed.

Investigation of a Combined Mnemonic Strategy for Teaching the Order of U.S. Presidents

In 1975, Richard Atkinson described a technique that he had been teaching to college students to improve their learning of foreign language vocabulary. Since that time, Atkinson's mnemonic keyword method has been the subject of considerable empirical investigation and theoretical analysis (see, for example, Higbee, 1979; Levin, in press; Bellezza, Note 1; Paivio & Desrochers, Note 2; and Pressley, Levin, & Delaney, Note 3). Recent adaptations and extensions of the method have taken place with respect to: (a) children's learning of second-language vocabulary (e.g., Pressley & Levin, 1978), as well as native-language vocabulary (e.g., Levin, McCormick, Miller, Kessler, & Pressley, Note 4); (b) elementary and junior high school students' learning of factual information (apart from vocabulary definitions) in a variety of curricular areas (e.g., Levin, Shriberg, Miller, McCormick, & Levin, 1980; Pressley & Dennis-Rounds, 1980; and Jones & Hall, Note 5); and (c) students' storage and retrieval of information contained in expository prose passages (e.g., Shriberg, Levin, McCormick, & Pressley, in press; Levin, Shriberg, & Kessler, Note 6; and McCormick, Note 7).

The present study investigates the potential of another type of extension, as reflected by the questions: Can the keyword method be effectively combined with other mnemonic strategies that are designed to facilitate coding of numerically ordered information? If so, can such a combined mnemonic approach be adapted to the social studies curriculum task of learning the numerical order of the U.S. presidents? The answers to these questions were far from obvious, in that: (i) the keyword

method is designed to handle unordered associations; (ii) mnemonic systems for coding more than about ten pieces of ordered information are very complex and time consuming (see, for example, Lorayne & Lucas, 1974); and (iii) mnemonic approaches that are intuitively reasonable on paper may produce surprises when subjected to empirical scrutiny (see Levin & Pressley, in press). In the present study, a simple mnemonic counting system was devised, which when combined with the keyword method, was taught to eighth-grade students in the context of learning the numbers of 20 U.S. presidents. Task variations, such as the particular presidents selected and whether students had to recall the presidents' names or numbers, were also investigated. It should also be mentioned that comparisons were made relative to a very challenging (and ecologically valid) control condition; namely, one in which students were given the list of presidents, study aids, and an equivalent amount of total time to learn the presidents' numbers according to their own preferred methods (see Levin et al., 1980; and Pressley, Levin, Hall, Miller, & Berry, 1980).

Method

Subjects and Design

The subjects were 48 eighth-grade students from a middle school serving a midwestern university community. All students were individually tested (by one of two female experimenters) in a small area inside the school building. Subjects were randomly assigned in equal numbers to one of two experimental conditions (mnemonic or control) and to one of two list orders (chronological or alphabetical). This resulted in 12 subjects in each condition/list order combination, with each experimenter testing six of the subjects. Students in the two control conditions learned the numbers of 20 U.S. presidents according to their own preferred

methods of study, whereas those in the two mnemonic conditions were provided with mnemonic instruction and associated line drawings.

Materials and Procedure

Mnemonic conditions. The illustrations provided essentially combined three different mnemonic systems: keyword, pegword, and loci. Keywords were selected to be familiar concrete words that sounded like part of the presidents' names (e.g., chef for Jefferson, link for Lincoln, granny for Grant), whereas pegwords and overlearned loci represented the numbers 1-40. With the pegword system, the numbers 1-10 are represented by concrete rhyming words (i.e., one is a bun, two is a shoe, etc.). Seasonal loci were then developed to represent decades of numbers (i.e., 1-10 was a spring garden scene, 11-20 was a summer beach scene, 21-30 was a fall football scene, and 31-40 was a winter snow scene). With this approach, each president (keyword) could be made to interact with a particular number (pegword placed in a specific locus). Thus, for example, to remember that Tyler was the tenth president, the student must code the number 10 as a hen in a garden scene (10 is a hen and spring represents the first set of ten numbers). Further, (s)he must learn that the keyword for Tyler is tie. Put these three items together and one derives the illustration that is Figure 1. In contrast, to learn that Garfield was the 20th president, the student would be shown a hen (10) in a beach scene (second decade of numbers), interacting with a life guard (Garfield), as in Figure 2.

Insert Figures 1 and 2 about here

In the chronological order conditions, the students were to learn the numbers of the first 20 men who served as president (i.e., Washington to Garfield). In the alphabetical order conditions, the students were to learn the numbers of the first 20 alphabetically-ordered presidents (i.e., Adams to Jefferson). The two list conditions were included in this experiment in order to determine whether the mnemonic method would be comparatively more effective when the input order was essentially scrambled (alphabetical) than when it was systematic (chronological). The assumption was that in the alphabetical order conditions, control students could not apply a simple serial rehearsal strategy as readily as they could with a chronologically ordered list.

Students in the mnemonic conditions (Mnemonic-Chronological, Mnemonic-Alphabetical) were first taught the pegword method and the method of loci. The experimenter read the pegwords for the numbers 1-10, while simultaneously pointing to the pegwords and numbers typed on a 5" x 8" (12.7 x 20.3 cm) index card. Students were then tested for their learning of pegword-number (e.g., "bun is ___?") and number-pegword (e.g., "1 is ___?") associations.

Loci were then introduced to expand the counting system. Students in the alphabetical order condition were given the four seasonal loci, to deal with the numbers 1-40, whereas those in the chronological order condition only needed two (spring and summer) for the numbers 1-20. Understanding of the method was assessed by asking students to respond correctly to four randomly selected questions [e.g., What represents the number ___? The number ___? What does a (pegword) in a (locus) scene mean? How about a ___ in a ___ scene?].

Next, the complete mnemonic strategy, including the keyword part of the method, was demonstrated to the mnemonic students by the use of two sample 8.5" x 11" (21.6 x 27.9 cm) colored line drawings. For those in the alphabetical order group, the two practice items were Adams and Jefferson (the first and twentieth presidents in alphabetical order) whereas for those in the chronological order condition the sample items were Washington and Garfield (the first and twentieth presidents in chronological order). In addition, the steps needed for students to retrieve either name or number information from their stored visual representations were demonstrated through two examples.

Then the students in the mnemonic conditions were taught the keywords ("word clues") for each president's name (from the appropriate list). Each president's name and associated keyword was typed on a 5" x 8" (12.7 x 20.3 cm) index card. Following a single study trial, keyword learning was assessed in both directions. That is, the student was first asked: "What is the word clue for (first name) (second name)'s last name?" for each of the 18 studied presidents. The students were then asked: "Whose name goes along with (keyword)?" for each president. Both types of keyword-learning assessment proceeded in a random order.

In the study phase of the experiment, each of the colored mnemonic illustrations was presented. The president's name, keyword, corresponding number, and pegword were printed on the top of each picture (see Figure 1). The experimenter read this information to each student and gave a brief description of the scene depicted in the illustration. The students were allowed 15 seconds to study each of the 18 pictures.

Control conditions. Students in the two control conditions (Alphabetical-Control, Chronological-Control) were instructed to use their own best way of studying to learn the order of the presidents. These students were given a list of the presidents and their numbers (arranged either chronologically or alphabetically) on an 8.5" x 11" (21.6 x 27.9 cm) sheet, two decks of 5" x 8" (12.7 x 20.3 cm) cards, and a pencil and paper to use in whatever way they wished to study the presidents. One set of cards had each president's name typed on one side and his number on the other. Students were told that they could use these cards to quiz themselves whenever they wished. The other set of cards contained pictures of each of the presidents with the president's name and number typed below each picture. This set of cards was included in an attempt to control for any motivating effect of pictures per se. The experimenter demonstrated the nature of these cards by using the same two practice items as in the experimental conditions. Before allowing the students to study on their own, the experimenter read twice through the list of presidents and their numbers as the students followed along on the 8.5" x 11" (21.6 x 27.9 cm) sheet. This was done in order to assure equal pre-familiarization with the presidents' names. The control students were allowed 11 minutes to study however they wished.

All conditions. Before the study phase of the experiment, students in all conditions were told that at test time half of the time they would be provided with a name and asked for a number. The other half of the time they would be provided with a number and asked for a name. In addition, before the testing phase of the experiment, control students were asked to think hard and to do their best to remember, whereas the experimental group was instructed to use the mnemonic procedure described to them previously.

In the testing phase of the experiment, the students were asked to respond with a name when given a number (i.e., "Who was number ___?") for nine presidents, and to respond with a number when given a name (i.e., "What number was ___?") for the other nine presidents. The order and type of question were randomly determined. Subjects were allowed as much time as they needed to respond to each question. The entire experimental procedure took approximately 30-35 minutes.

Results

The mean percentage of correctly recalled numbers and names was computed for each subject.[1] The data were then analyzed according to a 2 (list order) x 2 (experimental condition) x 2 (recall measure: numbers or names) analysis of variance, with the last factor measured within subjects. The main effects of list order and recall measure were not computed, however, in that the specific names included in the two lists and recall measures were not the same, and likely varied in terms of complexity, as well as in terms of students' prior familiarity with them. All F ratios were based on 1 and 44 degrees of freedom, and were converted to t statistics to permit directional hypothesis testing in some cases.

Overall, students who learned the presidents and their numbers according to the mnemonic method recalled a third more information than did free-study controls (means of 72.7% and 54.4% correct, respectively), $t = 2.62$, $p < .01$, one-tailed. There was no hint of a condition by list order interaction, $|t| < 1$. However, the within-cell variation in the two chronological list conditions was substantially greater than in the two alphabetical list conditions. When conditions differences were assessed separately by list order, it was found that consistent with expectation, mnemonic facilitation

accounted for almost twice as much variation on the alphabetical list (20%) than on the chronological list (11%). Finally, all effects associated with the number vs. name recall measure were significant (all $ps < .05$), where it was found that condition effects were moderated by recall measure on the alphabetical, but not on the chronological, list. Of course, and as mentioned earlier, such interactions must also be interpreted with respect to specific item differences associated with lists and recall measures.

Discussion

The effects of a mnemonic strategy combination, as applied to learning the order in which U.S. presidents served, are clearly impressive enough to warrant further attention. Students taught according to the mnemonic method outperformed control students. This was true whether they were provided with a well-ordered set of presidents to study (i.e., presidents presented in their proper serial order) or a more complicated set (i.e., presidents presented in alphabetical order). The results are even more impressive considering that the control students were free to use their study time however they wished. Thus, for example, the control students could distribute their study time so as to concentrate on the presidents that they did not already know. Informal self-report data collected during the experiment indicated that this is exactly how many control students proceeded.

Extensions of research in this domain are currently proceeding along two lines. First, the response latencies and serial position errors of mnemonic and control students are being investigated, in order to document more conclusively that different processing strategies are being applied

by subjects in the two conditions (see, for example, Roediger & Crowder, 1976).[2] Second, presidential biographical information is being incorporated into the present mnemonic procedure, in a manner similar to that of the previously mentioned Shriberg et al. (in press) study. In that study, eighth-grade students who were presented fictional biographical information in the context of short expository paragraphs remembered substantially more of that information when taught mnemonically than when left to their own devices. The focus of interest in the presidential domain is on determining the limits of mnemonic strategy combinations. In particular, how many and what kinds of links can be effectively incorporated into a mnemonic chain?

The present results show once again how a theoretically based mnemonic strategy--Atkinson's (1975) keyword method--can be successfully adapted to students' learning of actual curriculum content. Levin et al. (1980) found that a simple extension of the keyword method enabled elementary school children to improve their learning of one kind of social studies content (states and capitals), and now in this study we find that a mnemonic strategy combination can be of benefit to middle-school children when having to learn another kind of social studies content (the order of U.S. presidents). At the same time, it bears repeating that each new set of mnemonic curriculum adaptations needs to be examined under controlled conditions before any effectiveness claims can be made. Indeed, Levin, Kessler, Miller, and Bartell (Note 8) recently showed that certain commercially available "mnemonic" materials are not mnemonic at all when an empirical validation criterion was applied. In terms of the present problem for example, why wasn't the mnemonic facilitation associated with the less

organized alphabetical list statistically greater than that associated with the serially ordered chronological list? Is the particular mnemonic combination devised here optimal for teaching eighth graders the order of the presidents, or would an alternative mnemonic counting system based on letter-number correspondences (e.g., Lorayne & Lucas, 1974) prove to be equally (or even more) effective? And how would each of these number mnemonics compare to positioning the presidential keywords in a single serial chain, as Lucas (1978) has proposed? Clearly, the answers to such questions will come not from idle speculation, but rather from carefully controlled research investigations.

Reference Notes

1. Bellezza, F. S. Mnemonic devices: Classification, characteristics, and criteria. Unpublished manuscript, 1980.
2. Paivio, A., & Desrochers, A. Mnemonic techniques in second-language learning. Unpublished manuscript, 1980.
3. Pressley, M., Levin, J. R., & Delaney, H. D. The mnemonic keyword method (Theoretical Paper No. 92). Madison: Wisconsin Research and Development Center for Individualized Schooling, 1981.
4. Levin, J. R., McCormick, C. B., Miller, G. E., Kessler, J., & Pressley, M. Mnemonic versus nonmnemonic vocabulary-learning strategies for children (Working Paper No. 305). Madison: Wisconsin Research and Development Center for Individualized Schooling, 1981.
5. Jones, B. F., & Hall, J. W. School applications of the keyword method by eighth-graders. Paper presented at the annual meeting of the American Psychological Association, Toronto, August 1978.
6. Levin, J. R., Shriberg, L. K., & Kessler, J. Research in progress, 1981.
7. McCormick, C. B. Dissertation research in progress, 1981.
8. Levin, J. R., Kessler, J., Miller, G. E., & Bartell, N. P. More on how (and how not) to remember the states and their capitals (Working Paper No. 306). Madison: Wisconsin Research and Development Center for Individualized Schooling, 1981.

References

Atkinson, R. C. Mnemotechnics in second-language learning. American Psychologist, 1975, 30, 821-828.

Higbee, K. L. Recent research on visual mnemonics: Historical roots and educational fruits. Review of Educational Research, 1979, 49, 611-629.

Levin, J. R. The mnemonic '80s: Keywords in the classroom. Educational Psychologist, in press.

Levin, J. R., & Pressley, M. Understanding mnemonic imagery effects: A dozen "obvious" outcomes. Educational Technology, in press.

Levin, J. R., Shriberg, L. K., Miller, G. E., McCormick, C. B., & Levin, B. B. The keyword method in the classroom: How to remember the states and their capitals. Elementary School Journal, 1980, 80, 185-191.

Lorayne, H., & Lucas, J. The memory book. New York: Ballantine, 1974.

Lucas, J. Ready, set, remember. White's Creek, Tenn.: Memory Press, 1978.

Pressley, M., & Dennis-Rounds, J. Transfer of a mnemonic keyword strategy at two age levels. Journal of Educational Psychology, 1980, 72, 575-582.

Pressley, M., & Levin, J. R. Developmental constraints associated with children's use of the keyword method of foreign language vocabulary learning. Journal of Experimental Child Psychology, 1978, 26, 359-372.

Pressley, M., Levin, J. R., Hall, J. W., Miller, G. E., & Berry, J. K. The keyword method and foreign word acquisition. Journal of Experimental Psychology: Human Learning and Memory, 1980, 6, 163-173.

Roediger, H. L., III, & Crowder, R. G. A serial position effect in recall of United States presidents. Bulletin of the Psychonomic Society, 1976, 8, 275-278.

Shriberg, L. K., Levin, J. R., McCormick, C. B., & Pressley, M. Learning about "famous" people via the keyword method. Journal of Educational Psychology, in press.

Footnotes

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[1]Three of the presidents included (Carter, Ford, and Lincoln) were dropped from the analysis, due to historical recency or to students' prior knowledge. Interpretation of the results remains the same, however, whether or not these presidents are included.

[2]The serial position data from the present study cannot be meaningfully interpreted, as a result of the disparate item sets associated with the different lists and recall measures.

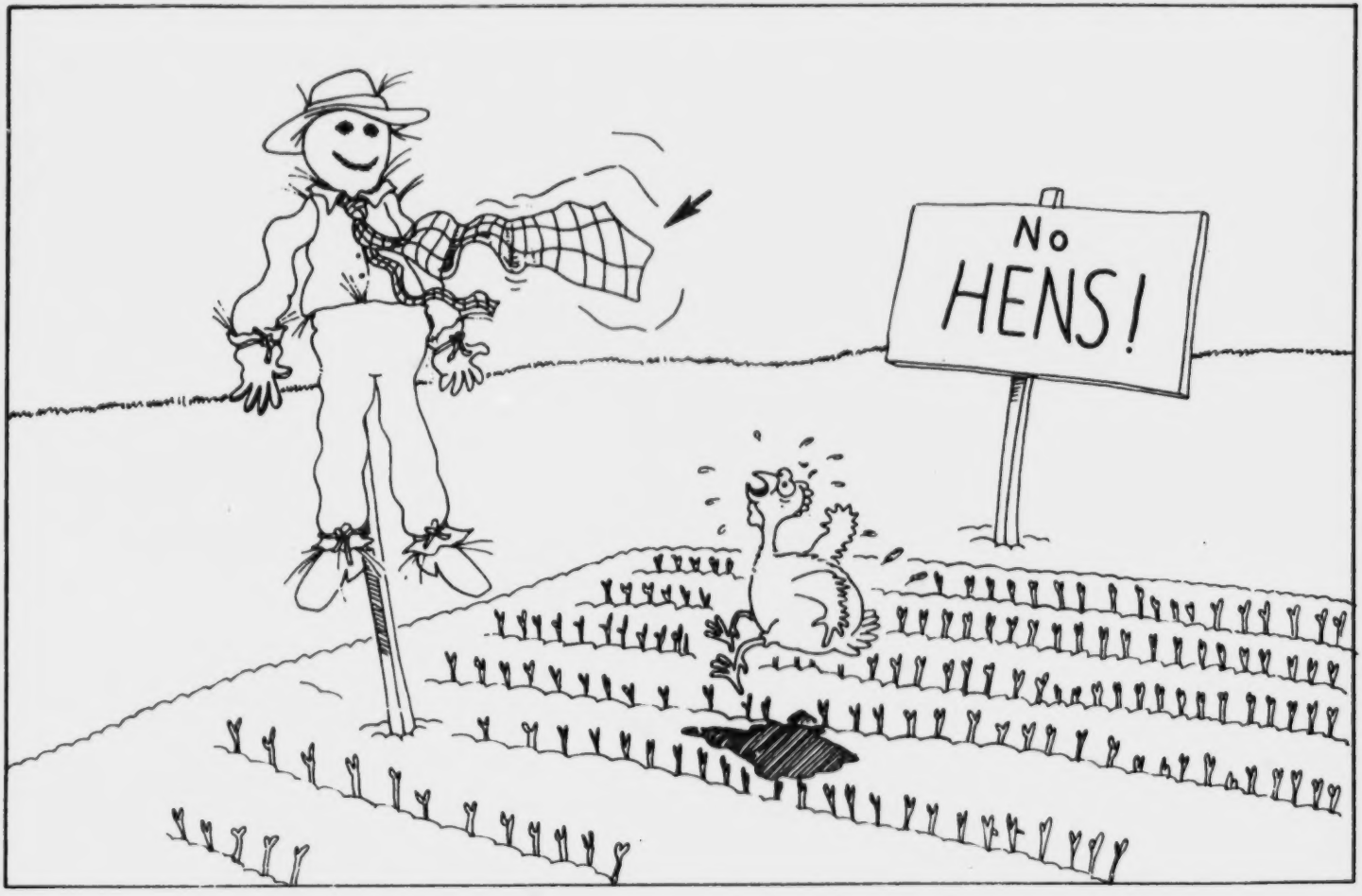
Figure Captions

Figure 1. Mnemonic illustration for Tyler = No. 10.

Figure 2. Mnemonic illustration for Garfield = No. 20.

10 John TYLER

hen tie



20 James GARFIELD

hen guard